Perspective

Becoming-Infrastructure: Datafication, Deactivation, and the Social Credit System

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ABSTRACT

How might critical library and information studies analyze the intersection of information infrastructures and class structures? The emergence of big data through "datafication" rests on the historical material process of information and communication technology (ICT) production and distribution. This paper explores the concept of datafication as an integrated component of information infrastructures unfolding within the social structures of capitalist society. Based on a materialist conception of datafication, a critical realist perspective is offered to theorize how the combination of heterogenous, distributed data sources generates new internal relations between class position, capital and the state. Two recent cases of datafication illustrate the capacity of big data to deepen forms of control within class-structured societies. The first case is drawn from a New York Times article concerning the subprime automobile loan market in the United States. The article details the installation of surveillance technologies in the vehicles of people segmented by low credit scores as a condition of exchange for subprime loans. As a result of this exchange, surveillance technologies capture borrower's driving behaviors and locations in real-time data flows. These data flows are combined with interest bearing payment regimes, rendering both vehicle and borrower as manageable assets while conferring onto lenders the power of remote automobile deactivation. This suggests datafication of driving behavior produces new implications for class conditions when such data are integrated with the structures of the subprime market. The second case is based on several news articles that detail plans for a large-scale top-down behavioral programming initiative by the Chinese government termed the 'social credit system,' built from digital traces of multiple

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economic and non-economic social behaviors of its citizens. While aspects of this system are currently voluntary, they are expected to become mandatory within five years. Ubiquitous surveillance of digital activity never before combined into a predictive and prescriptive score may be considered a nation-wide disciplinary subsumption of social activity under novel valuation algorithms, integrating previously unwatched or irrelevant external activities into new internal relations determinative of class-structured possibilities. The plan for a social credit system appears driven toward developing a seamlessly interconnected national behavioral identity for every Chinese citizen, which may produce structural implications for pre-existing class conditions. I suggest these cases are examples of the need for library and information studies to engage critically with emerging cybernetic forms of information infrastructures theorized here as deepening capital's control societies.

INTRODUCTION

Critical library and information studies are needed to analyze the social effects generated by the emergence and integration of large-scale information infrastructures within capitalist society. Noting the historical lack of critical perspectives on power structures that shape information and information systems, Fuchs has identified that the various turns in library and information science—from information theory, to the cognitive and information society perspectives—ought to lead researchers to embrace a fourth turn: critical information studies.[1] In this paper, I suggest Roy Bhaskar's philosophy of critical realism provides theoretical and conceptual tools for analyzing the ontology of information within class-structured society. Purposed to act as philosophical underlabourer to historical materialism,[2] critical realism's major ontological and epistemological positions were developed from *transcendental realism* in the philosophy of science[3] combined with a perspective known as *critical naturalism* in the philosophy of social science.[4] The philosophy of critical realism rests on a transcendental argument that Bhaskar used to identify a fundamental error of empiricism, termed the *epistemic fallacy*, which holds that mainstream philosophies often conflate ontology with epistemology or the reduction of reality to what can be apprehended by the senses. To critical realists, this conflation results in the presupposition of a mind-dependent reality.

In contrast, critical realists argue that ontology is separate and distinct from epistemology. As such, critical realism's presuppositions assert a realist or mind-independent ontology combined with a relativist position on epistemology.[5] Therefore, the experience of empirical phenomena is understood as the surface appearance of unobservable structures that are ultimately responsible for phenomena presented to the senses. This is based on the critical realist transcendental claim that the very intelligibility and stratification of the sciences is conditioned on the existence of a stratified external reality. Based on these positions, critical realists adhere to a depth ontology of reality, theorized as categorically distinct across three domains of the

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[1] Christian Fuchs, *Foundations of Critical Media and Information Studies* (Oxon: Routledge, 2011), 81.

[2] Andrew Brown, Steve Fleetwood, and John Michael Roberts. "The Marriage of Critical Realism and Marxism," *in Critical Realism and Marxism*, ed. Andrew Brown, Steve Fleetwood, and John Michael Roberts (London: Routledge, 2005), 1-22, Taylor & Francis e-Library.

[3] Roy Bhaskar, *The Possibility of Naturalism: A Philosophical Critique of the Human Sciences, Third Edition* (New York: Routledge, 2005), Taylor & Francis e-Library.

[4] Ibid.; Roy Bhaskar, *Dialectic: The Pulse of Freedom* (Oxon: Routledge, 2008b), Taylor & Francis e-Library; Margaret Archer, *Realist Social Theory: The Morphogenetic Approach* (Cambridge: Cambridge University Press, 1995).

[5] Bhaskar, *A Realist Theory of Science* (Oxon: Routledge, 2008), Kindle edition.

empirical, the actual and unobservable structures whereby objects contain causal powers and liabilities that, when combined, generate emergent properties irreducible to the individual constituents.[6] Actual events are argued to emerge from underlying structures thereby rendering empiricism alone an insufficient basis for knowledge claims. Further, actual events are claimed to exhibit causal *tendencies* in contrast to a presupposed constant conjunction of *events* or linear cause and effect relationships as they are apprehended by sense perception.

To theorize the existence of underlying structures and mechanisms, critical realists apply the method of retroduction to the analysis of the experience of empirical phenomena. According to Lawson, rather than induction or deduction, retroduction is the true purpose of inference, through which "the aim is not to cover a phenomenon under a generalization (this metal expands when heated because all metals do) but to identify a factor responsible for it, that helped produce it, or at least facilitated, it. The goal is to posit a mechanism (typically at a different level to the phenomenon being explained) which, if it existed and acted in the postulated manner, could account for the phenomenon singled out for explanation [..] Transcendental reasoning is thus but a special case of retroduction."[7] In the analysis of social reality, retroduction is used to theorize underlying intransitive *social* structures and mechanisms that produce actual events, which may or may not appear to sense perception as empirical phenomena.[8] A social structure may be understood as the specific form in which rules, norms, ideas and other shared practices shape and are shaped by human agency. On this point, critical realists maintain that people do not make society but rather people reproduce or transform social structures within society, a perspective that follows Marx in emphasizing the interplay between pre-existing social structures and the agentive reproduction or elaboration of these structures,[9] which include the social and material relations of political economy.

Other realist perspectives, such as assemblage theory,[10] presuppose *universal external relations*, which emphasize contingency and the independent constitution of objects as they are shared and transformed by social relations. By contrast, an *internal relation* refers to the movement, tendencies and mutual constitution of an object that would not exist without its historically specific relational opposite,[11] for example, as

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[6] Ibid.

[7] Tony Lawson*, Economics and Reality* (Oxon: Routledge, 2005), 212, Kindle edition.

[8] Bhaskar, *The Possibility of Naturalism: A Philosophical Critique of the Human Sciences.*

[9] Bhaskar, *The Possibility of Naturalism.*

[10] Ibid.; Kevin R. Cox, "Notes on a Brief Encounter: Critical Realism, Historical Materialism and Human Geography," *Dialogues in Human Geography* 3, no.1 (2013): 3-21; Ben Anderson, Matthew Kearnes, Collin MacFarlane and Dan Swanton, "On Assemblages and Geography," *Dialogues in Human Geography* 2 (2012): 171-189.

[11] Lawson, *Economics and Reality*, 164.

maintained by the capitalist mode of production (e.g. capital and labor, landlord and tenant, etc.). Critical realism recognizes the existence of both internal and external relations and the movement between artificially closed and open systems, where society is conceived as an open totality.[12] I suggest critical library and information studies might apply critical realist presuppositions and conceptions of reality to cases and exemplars of the social and material relations extended, transformed and/or negated by the integration of new sources of information within historically specific social structures. The purpose of this paper is to advance a critical realist perspective on big data with regard to the structural transformations resulting from capital's expansion and appropriation of new sources of information situated within class-structured society.

EMERGENCE OF BIG DATA WITHIN GLOBALIZED CAPITALISM

"Big data," "datafication" and "big data analytics" are terms recently popularized in the academic literature.[13] Big data is often defined according to a set of criteria or properties as found in the 'five V's': volume, velocity, variety, veracity and value.[14] Other perspectives tend to define big data as the massive accumulation of specifically *unstructured* data, generated, for example, by activity on social media platforms.[15] Further still, other definitions answer in the negative, where big data is defined as data sets that are so large as to exceed existing computational capabilities, therefore requiring advanced parallel processing to detect patterns, generate 'insights' and produce actionable predictions.[16] The appropriation and use of big data technologies by corporations, institutions and governments has been critiqued in the literature based on several social implications of its arrival including new

[12] Cox, "Notes on a Brief Encounter."

[13] dana boyd and Kate Crawford, "Critical Questions for Big Data: Provocations for a Cultural, Technological, and Scholarly Phenomenon," *Information, Communication & Society* 15, no.5 (2012): 662-679; Jose Van Dijck, "Datafication, Dataism and Dataveillance: Big Data between Scientific Paradigm and Ideology," *Surveillance and Society* 12, no. 2 (2014): 197-208.

[14] Victor Mayer-Schonberger and Kenneth Cukier, *Big Data: A Revolution That Will Transform How We Live, Work, and Think* (New York: Houghton Mifflin and Harcourt, 2013), Kindle Edition.

[15] Rob Kitchin, *The Data Revolution: Big Data, Open Data, Data Infrastructures & Their Consequences* (London: Sage, 2014), Kindle Edition.

[16] Paul Zikopoulos , Chris Eaton, Dirk DeRoos, Tom Deutsch, and George Lapis, *Big Data: Analytics for Enterprise Class Hadoop and Streaming Data* (New York: McGraw-Hill Media, 2012).

epistemological challenges of identifying and predicting social patterns[17] and problems of ethics, surveillance, discrimination and privacy.[18] However, few analyses consider big data's appearance as a phenomenon of the continuity of historically specific social structures. As a result, the analysis and critique of big data as it is used to extend the reach of the circuits of capital remain uncontested social and political terrain.

The accumulation and concentrated ownership of big data may be understood as an emergent social formation dependent upon a complex historical material geography of technology production and distribution. Epochal demarcations such as the "information economy" or the "new economy" tend to abstract from the underlying material forces and relations of the global division of labor within the capitalist mode of production that have produced *the means of data production,* known as information and communication technologies (ICTs). For example, Dyer-Witheford notes that Africans labor under extremely exploitive conditions to extract and deliver the raw materials used in the supply networks that feed the assembly of iPhones, tablets and computer hardware components in Chinese factories.[19] Yet these relations are masked as ICTs appear as commodities with use value and exchange value to consumers who include individuals, corporations, institutions and governments situated within pre-existing political and economic class structures. Therefore, the appearance of the production, circulation and exchange of digital data and information may be retroduced to the social relations and forces of the material production and distribution of ICTs.

"ICTs" may refer to a single device or multiple devices, including laptops, smartphones, wearables, sensors and the Internet of Things (IoT) typically connected to a network of servers, databases, and other material hardware. The capability of ICTs to generate and distribute data among several institutions and corporate agents may be understood to generate new social, political and economic relations. As Kallinikos notes, ICTs enable the geographical distribution of social structures across society and, thus, "taken together these developments seem to suggest that ICTs are instrumental in bringing together aspects of the world that had previously remained unrelated in terms of function or locality."[20] In total, the distribution of ICTs may also be viewed as components that capture and integrate data as part of larger *information*

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[17] Rob Kitchin, "Big Data, New Epistemologies and Paradigm Shifts," *Big Data & Society* (2014): 1-12; Kate Crawford, Kate Milter, and Mary L. Gray, "Critiquing Big Data." Politics, Ethics, Epistemology," *International Journal of Communication*, 8 (2014): 1663-1672.

[18] Ibid.; Ralph Schroeder, "Big Data and the Brave New World of Social Media Research," *Big Data and Society* 1, no. 2 (2014): 1-11.

[19] Nick Dyer-Witheford, *Cyberproletariat: Global Labor in the Digital Vortex* (Toronto: Pluto Press, 2015).

[20] Jannis Kallinikos, "The Order of Technology: Complexity and Control in a Connected World," *Organization* 5, no. 3 (2005): 187, doi:10.1016/j.infoandorg.2005.02.001.

infrastructures, which include massive shared systems such as the Internet.[21] Information infrastructures may also be defined by the capacity to mediate the reproduction of existing social structures or the production of entirely new social structures. Additionally, the accumulation of big data presupposes historically specific relations of ownership and control over ICTs. Therefore, big data may be theorized as emergent from the combination of the political economic distribution of ICTs and the human information behavior and/or surveillance of social activity that results in a digital spatiotemporal signature.

Developed over time, information infrastructures contain the potential for building new internal social relations with capital, driven by dialectical mechanisms of *data capture* and *data analysis*—mechanisms consistent with the emergence and distribution of control society.[22] ICTs may therefore be understood to dialectically serve users of information and to produce evidence of that use to data analysts. On this point, it is important to consider that analyses of big data tend to assume either the user or the analyst side of this user-analyst relation. In contrast, I suggest a critical realist depth ontology of big data would include the study of: (1) the distribution of the means of data production (ICTs) from both the user and the analyst's standpoint, and (2) the introduction of ICTs to social processes and the subsequent opening of visibility of those social processes, known as *datafication*. Datafication may be considered a primary entry point of representing real world subjects, objects and processes toward the accumulation of "big data."[23] Further, according Mayer-Schonberger and Cukier, datafication refers to "a description of something that allows it to be recorded, analyzed, and re-organized."[24] This implies datafication refers to the digital capture of social activities for the use, transformation and manipulation of subjects and objects through combination with other information infrastructures (monetary system, etc.). On this point, the critical realist position on the epistemic fallacy would hold that the ontology of subjects and objects is not necessarily transformed through datafication. Rather, what may change is the social epistemology of those subjects and objects as mediated by datafication. This does not preclude, however, transformative actions taken in relation to those subjects and objects that may result. Thus, I suggest

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[21] Hanseth and Monteiro, *Understanding Information Infrastructure* (Oslo, Norway: Unpublished manuscript, 1998), http://heim.ifi.uio.no/~oleha/Publications/bok.pdf

[22] Gilles Deleuze, "Postscript on the Societies of Control," *October* 59, (Winter 1992): 3-7, accessed July 12, 2005, http://links.jstor.org/sici?sici=0162-870%28199224%2959%3C3%3APOTSOC%3E2.0.CO%3B2-T; James Beniger, *The Control Revolution: Technological and Economic Origins of the Information Society*, (Cambridge: Harvard University Press, 1986).

[23] Mayer-Schonberger, Viktor, and Kenneth Cukier. *Big Data: A Revolution That Will Transform How We Live, Work and Think.* New York: Houghton Mifflin Harcourt, 2013. Kindle Edition.

[24] Ibid., 90.

datafication refers to an initial process of subject or object subsumption within pre-existing social structures.

On the data analyst side of the user-analyst relation, data may be re-arranged, combined and integrated with other information infrastructures that embody the logic of capital such as the digital money system, mechanisms of financialization and pricing algorithms. Critical realism's acceptance of emergence implies that the integration of data sets, presumed to represent real social patterns of events, generates emergent causal powers that, when combined, are irreducible to each individual data source. For instance, when big data analytics are automated, this integrates not just data, but *social causality* across contexts of non-economic activity and often subsumes such activity to the logic of capital. As a result, what appears to be transacted between datafication and data analytics is what has been described as "control information."[25] According to Corning, "control information has a number of distinctive properties. First and foremost, it does not have any independent existence. It is not a concrete thing or mechanism. It is defined (and specified) by the *relationship* between a particular cybernetic system (a user) and his/her/its environment(s)—external and internal." [26] Thus, control information may be understood to contain no value outside of the specific structures and relations and of its production. On the contrary, its value is dependent on the social structures and relations it mediates. Therefore, as the empirical expression of quantity that masks underlying social relations, control information may be analyzed as differentially contingent on and partially determined by: (1) the distribution of ICTs, (2) capital's appropriation and integration of ICTs within the circuits of production, distribution and exchange and, (3) capital's appropriation and analytical integration of data sets within information infrastructures that mediate pre-existing political and economic structures.

As I have outlined in abstract form, the critical realist method of retroduction may inform the social study of big data, datafication and big data analytics as technologies that both produce and rely upon control information to extend, transform and/or negate pre-existing social structures. By studying the collection, storage, and analysis of control information generated by the distribution of the means of data production within specific social and political contexts, critical library and information researchers may contribute a deeper understanding to how both data and its subjects and objects are shaped and reorganized in the service of state, institutional and corporate interests. The following retroductive analysis of two case studies examines

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[25] Pasquinelli, Matteo. "Italian *Operaismo* and the Information Machine." *Theory, Culture & Society* 32, no. 3 (2015): 49-68; Peter A. Corning, "Control Information Theory: The 'Missing Link' in the Science of Cybernetics," *Systems Research and Behavioral Science* 24 (2007): 297-311.

[26] Corning, "Control Information Theory," 302.

how datafication transforms external relations (contingency) to internal relations (necessity)—or the subsumption of formerly unrecorded and unconnected processes that have become internally necessary with capital. The first case is an analysis of a news report detailing how new surveillance technologies have been used to support the territorial expansion of debt relations and micro-calculation of human driving behavior as a symptom of the U.S. subprime automobile loan market. The second case is an analysis of news reports detailing recent plans by the Chinese government to develop a massive big data system of behavioral programming by connecting and valuing multiple sources of online digital activity against risk calculations for every citizen, which I suggest represents the subsumption of social activity under disciplinary market algorithms.

DEBT TELEMATICS: CONTROL INFORMATION AND DEACTIVATION

The recent expansion of the subprime automobile loan market in the United States is an instructive reminder of the predatory lending practices that inflated and ultimately crashed the subprime housing market in 2008 with global repercussions. As covered by *The New York Times,* subprime automobile loans have grown considerably, as Corkery and Silver-Greenberg note, "lenders are reaching deeper and deeper into the ranks of Americans on the financial margins, with interest rates on some of the loans exceeding 29 percent."[27] Subprime automobile loans have been made available to people who could not access such loans due to low credit scores and who subsequently live under lower class conditions. The subprime automobile market is comprised of people with scores below 640, which is considered high-risk in a market that has grown over the past five years.[28] In exchange for these subprime loans, lenders require the installation of surveillance technologies in the vehicles of borrowers. These devices are designed to capture a driver's GPS data, which allows for lender scrutiny of the borrower's locations, used to refine calculation of risk and return on capital. This results in additional capacities for lenders to exert further downward pressure on borrowers to meet their payment deadlines.[29] Thus, once datafied, the driving behavior of borrowers previously in an external relation to capital are connected to abstract coordinates of debt relations, producing new internal relations between driving behavior, location and payment schedules.

As an interconnected form of control, this relation further subsumes the human need for transportation under the forces of debt relations, which produces new control

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[27] Ibid.

[28] Ibid.

[29] Michael Corkery and Jessica Silver-Greenberg, "Miss a Payment? Good Luck Moving that Car," *New York Times,* September 24, 2014, Accessed July 19, 2015, http://nyti.ms/1uqcAtm.

information over a driver's movement, thereby opening a market of two million people to calculations never before made possible. For example, the analytical software employed by lenders allows for "geo-fences" to be ideally mapped onto real world geography. The data analytics reveal if a borrower is going outside their usual place of employment, which in turn may affect risk and the return on capital of debt investors.[30] Further, the devices give lenders the power to remotely deactivate the vehicle if payments are submitted past the monthly due date, which refines the repossession process that previously may have taken up to a month. The capability of remote deactivation is an example of the relational power of control information afforded to lenders over the lives of people who require the means of transportation to sell their labor power and, in contradiction, continue the cycle of high interest loan payments.[31]

How might a critical realist retroductive analysis examine the class structure that emerges from this exchange? While it is certainly possible to critique the use of surveillance technologies in vehicles on ethical grounds, I suggest it is more compelling to consider the unobservable antecedent structures that are presupposed by borrowers and lenders entering debt market relations. That is, retroduction might explain this social formation based on the underlying law of competition and capital's need to expand calculation of risk in the subprime market. In this system, lenders do not exist without borrowers, therefore, they are both in an internal relation generated by invisible market forces or the pre-existing social structures that produce the actual movements of exchange where the instrumentalization of ICTs takes on specific functions in the service of interest-bearing capital. People struggling in lower class conditions require transportation to sell their labor power and access to a vehicle may be quite difficult with a poor credit score, another form of control information that embodies a persistent economic identity. Prior to exchange, driving behavior and geolocation are external to debt payment schedules with these relations becoming internal to both market forces and debt schedules following exchange. From the empirical perspective of lenders, borrowers are reduced to geolocated data points produced by the data analytics that surface a borrower's location while both distancing and erasing their class circumstances. This appears as a digital grid connecting payment schedules on one side, to micro behaviors on the other, producing the capacity for lenders to deactivate and reactivate vehicles. As a result of exchanging access to credit for pervasive surveillance, control information triangulates new relations between the sources of payment schedules, driving behavior and location, thereby transforming the social and material relations of debt. Thus, in this case control information has materialized, moving into the driving locations and behaviors of subprime borrowers, rendering them and their movements as manageable and accountable assets.

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[30] Ibid.

[31] Ibid.

CYBERNETIC STATE CAPITALISM AND THE SOCIAL CREDIT SYSTEM

The second case of datafication is drawn from recent news reports of the Chinese government's proposed development of a "social credit system."[32] This massive national information infrastructure will be designed to integrate each citizen's online data in a "social credit score," used to generate structural privileges and reinforcement or punishment for those citizens who exhibit information behaviors that are calculated by algorithms as acceptable or unacceptable. Creemers explains, "individuals and businesses will be scored on various aspects of their conduct -- where you go, what you buy and who you know -- and these scores will be integrated within a comprehensive database that not only links into government information, but also to data collected by private businesses."[33] Hodson notes, "China's Social Credit System (SCS) will come up with these ratings by linking up personal data held by banks, e-commerce sites and social media. […] ...how many points are on your driving license: these are just a few of the details that the Chinese government will track – to give scores to all its citizens."[34]

How might critical library and information studies systematically study the emergence and integration of control information through the development of large-scale information infrastructures? I suggest the method of retroduction may inform Marxian state theory by identifying three mutually reinforcing generative mechanisms that have created China's big data capabilities, grounded in the ontological materialism of ICTs: (1) the material production, distribution and exchange of ICTs as commodities, (2) the datafication of non-economic processes that capture and accumulate big data at the corporate and state level, and (3) the analysis and feedback of control information on class structures. That is, if the social credit system will be designed to assign values to citizens based on their digitally mediated behaviors, information infrastructures may be studied as emergent historical phenomena grounded in the interaction between social activities, the distribution of ICTs and the integration of behavioral data with market mechanisms. To theorize the underlying social structures and mechanisms of the Chinese social credit system, it is important to first theorize the intersection of China's state form in relation to its private sector.

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[32] Celina Hatton, "China 'Social Credit': China Sets Up Huge System," *BBC News*, October 26, 2015, accessed November 22, 2015, http://www.bbc.com/news/world-asia-china-34592186

[33] Rogier Creemers, "China's Chilling Plan to Use Social Credit Ratings to Keep Score on its Citizens," *CNN*, October, 27, 2015, accessed November 16, 2015, http://www.cnn.com/2015/10/27/opinions/china-social-credit-score-creemers/

[34] Hal Hodson, "Inside China's Plan to Give Every Citizen a Character Score." *New Scientist*, October 9, 2015. Accessed December 5, 2015. https://www.newscientist.com/article/dn28314-inside-chinas-plan-to-give-every-citizen-a-character-score/

What has complicated theoretical analyses of the state form is the era of neoliberal restructuring in Western societies coupled with the legacy of market globalization and global expansion of the capitalist mode of production. In the case of Chinese capitalism since the fall of Maoism, it has been argued that China has been progressively transformed into an oligarchic corporate state formation, which has resulted not necessarily in neoliberal restructuring of the state, but rather in a complex dialectic between vertically structured state control and market liberalization.[35] The state in capitalist societies may be regarded as an independent entity yet functionally inseparable from the relations and moments of the capital accumulation process it sanctions. Following Marx's base/superstructure metaphor, the material base of production is understood as primary to the emergence of the ideological, political, and juridical superstructure of class interests within civil society and the state which ensure the reproduction of the conditions of capital accumulation. While this metaphor has often led to claims that Marxism suffers from a deterministic or linear understanding of social causality, Bhaskar succinctly explains these are common errors in understanding the base/superstructure causal relation in that, "Marxists have long recognized two errors: *idealism,* dislocation of a superstructure from the base (or the totality); and *reductionism* (or economism), reduction of a superstructure to a mechanical effect or epiphenomenon of the base (or to an expression of the totality)."[36] The superstructure may be considered more properly as an emergent social formation with unique properties irreducible to its aggregate material bases. Following this position, big data may similarly be considered the emergent "raw materials" for large-scale systems that turn back on, dominate and restructure the relations of its producers. That is, the power of an emergent superstructure embodied in control information may act back on its constituents and it is in this respect that information infrastructure may be considered to exhibit causal tendencies in maintaining or reproducing the economic base within the spheres of production, circulation and consumption.

Jessop's elaboration of Marxist state theory provides analyses of the potential underlying structures and mechanisms engaged in mediating class structured relations between the state, civil society and citizens. These perspectives are classified as the instrumentalist, structuralist, and his more recently developed, strategic-relational perspective.[37] The *instrumentalist* view assumes that a specific class is in control of domination, imbued with the ability to enact its collective will on all other classes through the mechanisms of state power. As Jessop points out, however, this view is rather limited because it tends to homogenize the class positions of politicians, other

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[35] Ibid., 163.

[36] Bhaskar, *The Possibility of Naturalism*, 71-72.

[37] Bob Jessop, "The Capitalist State and the Rule of Capital: Problems in the Analysis of Business Associations," *West European Politics* 6, no. 2 (1983): 139-162.

state agents and their actions in securing the enactment of specific class-dominated interests, which implies a tendency to ignore potential contradictions between state interests and the interests of capital.[38] The *structuralist* view, on the other hand, emphasizes the existence of structural constraints on the actions of state agents that are determined by the interests of capital accumulation, which enforces limits on state power.[39] Thus, in the structural view it is not so much that a specific class is in control of the reins of state power. Rather, it is the specifically capitalist mode of reproduction that shapes the actions of agents and the subsequent structuring of pathways to acceptable governance. Finally, the *strategic-relational* perspective draws on Poulantzas' notion of the "structural selectivity" of state power, understood fundamentally as a *social relation*, or in Jessop's terminology, a "strategically selective" social relation.[40] The relational view of the state appears consistent with an understanding of it as an emergent power formation that enacts concrete strategies, goals and activities that selectively structure the relations and forces of the economic base in the interests of capital.

By considering the state as a strategic-relational entity that responds to the interests of civil society and that partly expresses those interests through the formation and configuration of information infrastructures, it follows that the development of big data analytics from within and between the state and private sector may ensure the formation of complex social market relations. Therefore, as an emergent product of the base, datafied social communications may be understood as the embodied content of the superstructure in the form of an *information superstructure*. As an expression of state power, this would position both the material and ideological aspects of information infrastructure as a relational entity of mediation that transforms internal and external relations by absorbing or subsuming recorded social processes into new control information integrated with market structures. For example, according to Hatton the social credit system has yet to be implemented, but "for now, the government is watching how eight Chinese companies issue their own 'social credit' scores under state-approved pilot projects. One of the most high-profile projects is by Sesame Credit, the financial wing of Alibaba. With 400 million users, Alibaba is the world's biggest online shopping platform. It's using its unique database of consumer information to compile individual 'social credit' scores."[41] Thus, it appears that the state's strategic relation with the private sector is such that the private sector informs the state by providing real world testing of a social credit system already active in the private sector, which will eventually integrate its data sources with the state. Indeed,

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[38] Ibid.
[39] Ibid.
[40] Bob Jessop, *State Power* (Cambridge, UK: Polity, 2013).
[41] Hatton, "China 'Social Credit.'"

Hudson also notes, “Sesame Credit is just one step towards the bigger, all-encompassing national system. By 2020 the SCS will take into account points on your driver’s license and how you are evaluated in your career as a doctor, lawyer or teacher…”[42] Therefore, based on these developments, I suggest the emergence of a massive social credit system in China appears to be an outgrowth of what has been termed “cybernetic capitalism,”[43] toward a historical form more aptly termed “cybernetic state capitalism.”

The extension of state power through the appropriation of advanced computational power began with attempts to apply cybernetic principles to the planning and regulation of the Soviet economy.[44] In the West, early pioneers in cybernetics such as Stafford Beer and W. Ross Ashby developed the first theories and principles of cybernetic systems and social regulation of “viable systems”[45] and it is in these early forms of informational governance that the history of social control systems may be found. One critical aspect of the cybernetic regulation of social systems is Ashby’s “law of requisite variety.” Conceived as a law of control, the law of requisite variety simply states “only variety absorbs variety.”[46] That is, in order for any system to achieve control of complex social phenomena, the variety of control elements of a system must match the variety of states expressed by the phenomena to be controlled. In this sense, the variety of data captured about or from within a social system must match the complexity of that social system for control to be achieved.

Based on the history of information infrastructure deployed as a mechanism of cybernetic control, transformation of the state-capital relation through distribution of the means of data production will inevitably produce structural implications for class formations within the Chinese population. At scale, datafication is achieved through the historical distribution of ICTs, which may be understood as the entry point of social communications, transactions and actions that produce data and mediate social reality. Information infrastructures may therefore be understood to absorb not only a variety of objectified human activities in the form of data and information but also a variety of living human activities, expressed thoughts, and behaviors when placed under specific feedback conditions. It is in this sense that the emergence of a social credit system may be viewed as an attempt by the state to absorb divergence and integrate control information over real citizen behaviors by tying them to market forces. Vertically

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[42] Hodson, “Inside China’s Plan.”

[43] Michael A. Peters, Rogrigo Britez, and Ergin Bulut, “Cybernetic Capitalism, Informationalism and Cognitive Labor,” *Geopolitics, History and International Relations* 1, no. 2 (2009): 11-40.

[44] See, for example, Nick Dyer-Witheford, “Red Plenty Platforms,” *Culture Machine*, 14 (2013): 1-27; and Eden Medina, "Designing Freedom, Regulating a Nation: Socialist Cybernetics in Allende's Chile,” *Journal of Latin American Studies* 38 (2006): 571-606.

[45] Stafford Beer, *Decision and Control: The Meaning of Operational Research and Management Cybernetics* (Chichester, NY: Wiley, 1995).

[46] W. Ross Ashby, *An Introduction to Cybernetics* (London: Chapman and Hall, 1957).

controlled state sanctioned activities are to be found in particular strategic relations as actualized in the configuration of information infrastructures built on top of the big data produced by China's citizens, which may lead to the cybernetic enclosure of social activity. Broadly, the social credit system appears to absorb human variety into new internal relations within the state-capital relation in a form of social market financialization. Thus, in a form similar to the case of automobile control information, the social credit system appears to connect digitally mediated behaviors with market forces. However, in the Chinese situation, input data sources have grown into big data, which integrates several points of contact to potentially include political speech.[47] Therefore, a proposed social credit system is not simply a matter of vertical state power, rather, it may be considered lateral and multiply determined based on social activity repurposed by the state as an input to social credit calculation. To further grasp the data sources and control structures of the social credit system, its components may be analyzed as a cybernetic circuit passing through the categories of: (1) inputs as the absorption or subsumption of objectified human variety represented in computational variety, (2) outputs as the integrated calculation and valuation of human activity, and (3) feedback of control information in the form of credit scoring and market-driven behavioral programming.

The input sources of the social credit system appear based on pre-existing long-term structural datafication grounded in historical-material processes specific to the capitalist mode of production. That is, such a national system could not be proposed without a history of production and distribution of networked ICTs and platforms in the form of commodities, nor without the human activities internal to capital that drive large scale growth of data where, in fact, "what has changed today is that products are being released whose entire purpose is the data it's collecting and the analytics it enables."[48] As Humphries notes, possible inputs into the Chinese social credit system include several data points and sources,

> All social networks in China are run by either Alibaba or Tencent. The government has access to all this social data, tracks it, and tweaks scores based on it. These companies are in charge of keeping your score up-to-date. Assets, income, and credit history still play a part in the scoring, but so does political opinion. If you post a negative political comment or political thoughts without

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[47] Matt Humphries, "Every Chinese Citizen Will Soon Have a Score Based on How They Live and Conform," *Geek.com*, October 6, 2015, accessed December 5, 2015, http://www.geek.com/news/every-chinese-citizen-will-soon-have-a-score-based-on-how-they-live-and-conform-1635832/

[48] Franks, The Analytics Revolution: How to Improve your Business by Making your Analytics *Operational in the Big Data Era* (Hoboken: John Wiley & Sons, 2014), 21.

> permission, your score goes down. Mention a particularly sensitive issue (e.g. Tienanmen Square massacre) and expect your score to be negatively impacted even further.[49]

The output stage is where state power shapes the big data analytics used to examine behavioral variety in the population as a mechanism toward achieving large-scale social control. The causal power of automation, built from these control systems, are dependent on the evolution of operational analytics from 1.0 to 2.0 and, recently 3.0, which have advanced the capabilities of description, prediction, and prescription, where human intervention is removed and automated triggering of events is achieved.[50] Although digital traces of networked human activity have existed for decades, what appears unique in the Chinese case is in the reduction of multiple social contexts of digitally captured activity into a social credit score that generates new causal powers within class structures, variably opening or closing access to resources. Datafication codes subjects as data objects in space-time, and these objects will be integrated and fed to state algorithms, which may result in new structural constraints for those subjects situated in pre-existing class structures. For example, Hodson notes,

> The scores will serve not just to indicate an individual's credit risk, but could be used by potential landlords, employers and even romantic partners to gauge an individual's character. […] The higher your score, the more opportunities it opens up. People with a score of 600 or more can rent cars from the Chinese companies eHai.com and Car Inc., without putting down a deposit. A score higher than 650 lets people check out of hotels faster, while more than 700 earns a reduction in paperwork for visas to Singapore.[51]

From a critical realist perspective, prediction of social phenomena is problematic because social reality is presupposed to consist of historically and socially transitive entities. In Lawson's analysis of predictive systems, he writes, "for the possibility of successful prediction, turning as it does on the existence of constant conjunctions of events, would mean either that the future is already determined, or, if exogenous variables could be fixed by us, open to social *control*."[52] Indeed, critical realism's critique of social scientific prediction is based on the assertion that social systems are open by their very nature. However, there is the possibility that the continuous saturation of society with ICTs and the continuous engineering of control information designed to

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[49] Matt Humphries, "Every Chinese Citizen."
[50] Ibid.
[51] Hodson, "Inside China's Plan."
[52] Lawson, *Economics and Reality*, 289.

mediate social relations may lead to the effective closure of formerly open systems, potentially strengthening predictive power overtime. This might effectively produce an artificial positivism by reengineering the social world to run most of its communicative processes through ICTs and by gradually aligning social communication to the information infrastructures designed to capture it, which would potentially render social activity predictable. For instance, processes of successive approximation or behavioral habituation around ICTs at the moments of input and feedback may be combined with increased automation and integration with the ideological superstructure. The weighing of outputs as normatively "positive" or "negative" or as high or low risk through algorithms can therefore only be understood as relative to the needs of corporate and state processing, a point which is consistent with the definition of control information as being relative to the social relations to which it becomes subject. Indeed, while control information may appear empirically objective, the critical recognition of its ideological position in social relations may become masked by automation, which could result in a cybernetic enclosure of social systems that actually create its own predictive validity over time and where feedback in the form of a credit score would be misunderstood as objective rather than as many-sided and historically subjective. Thus, the underlying structures of social credit scores may remain hidden or "black boxed" if the ontology of information is presupposed as empirically real rather than as a historical material product of the distribution of ICTs, human agency and the state's analytical systems combined with a market structure of social determination.

In the feedback stage, the state "seeks to leverage the explosion in personal data generated through smartphones, apps and online transactions in order to improve citizens' behavior."[53] Through feedback, the interpretation of social credit scores includes not only an individual process of subject formation but also a socially determined process of structural conditioning generated by a shared information superstructure because scores are being made public in China. Hudson notes, "The Chinese government already has a website that will eventually allow any citizen to check out another's credit rating. Run with help from Baidu, China's main search engine, it uses data from 37 central government departments and also displays interactions with the state, such as any court judgments against individuals."[54] Further, such large-scale integration has the potential to span not only official state or institutional interactions but also the activity of local social networks. Humphries explains, "You see, because the data is being tracked through social networks the government knows who all your friends are. If any of your friends post political comments, their score goes down but so does yours because you are their friend. By linking the two it is clear the government

[53] Creemers, "China's Chilling Plan."
[54] Hodson, "Inside China's Plan."

wants everyone to keep their friends from stepping out of line."[55] Thus, the normative structure of cybernetic feedback must be understood in relation to the Chinese state form, which quantifies and opens new forms of behavioral programming according to the needs of a corporately controlled social marketplace, yet it also relies on a collectively enforced system of subject formation.

By creating a cybernetic loop of datafied social activity, the social, political and class implications of a social credit system are significant as all forms of online digital communication may be repurposed for social credit calculations with causal feedback on pre-existing class structures. The structural integration of social credit outputs therefore involves more than the shaping of subjectivity if these outputs are prescriptive in triggering non-negotiable events in Chinese society. Indeed, the social credit system may represent a significant alteration to the dynamics of social causality because the introduction of a social credit system signals that China aims to socially engineer a feedback loop designed to change the actual behaviors of its citizens as determined by the algorithms of state cybernetic capitalism. Hatton suggests, "perhaps it is good for all citizens to learn quickly about the concept of a "social credit" score, while it is still partly voluntary. Within five years, the government's mandatory system will rank everyone within China's borders."[56] Open embrace of these initiatives will be juxtaposed against the resistance of citizens who struggle against the social credit system. It will therefore be critical to examine how strategic relations between the state and private sector are materialized through the national information superstructure and how enclosure of social communication is achieved through the policy and legislative process of making the system mandatory, a process that may simultaneously open black market identities[57] for those citizens who seek to escape the state-corporate nexus of determination.

CONCLUSION

In this paper I have outlined how critical library and information studies might theorize big data, datafication and big data analytics as technologies embedded within historically specific political, economic and social relations of control society. Critical realism's method of retroduction may act as philosophical underlabourer for historical materialism by elaborating concepts such as the epistemic fallacy, the ontological stratification of reality and the irreducible dynamics of emergence. As such, retroduction informs historical and social structural analysis of empirically emergent social forms, such as control information, and the underlying structures responsible for

[55] Humphries, "Every Chinese Citizen."
[56] Hatton, "China 'Social Credit.'"
[57] Hodson, "Inside China's Plan."

the appearance of such forms. On this front, I have suggested an ontology of big data grounded in the material history of the distribution of ICTs as components connected to a larger information superstructure of cybernetic social control. Further research might examine other social forms of information that extend, transform and/or negate the pre-existing internal and external relations of social structures generated and maintained by the capitalist mode of production.

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